

Application No. 10/711,841
Technology Center 2827
Amendment dated October 27, 2006
Reply to Office Action dated June 28, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1 (Currently amended): A semiconductor memory device comprising a bank with multiple pages, the device comprising means for keeping multiple pages open on the bank, wherein the keeping means comprises latches coupled to a sense amplifier associated with the bank, the latches operating in the storage of data read-from and written-to the sense amplifier.

Claim 2 (Currently amended): The semiconductor A semiconductor memory device according to claim 1, wherein the keeping means is operative to post a precharge command immediately after a command for a first access of one of the multiple pages in anticipation of a subsequent access of the page, the keeping means keeping the page open for a number of clock cycles and the precharge command causing a precharge operation to be executed after completion of the number of clock cycles.

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Claim 3 (Currently amended): The semiconductor ~~A semiconductor~~
memory device according to claim 2, further comprising means for resetting the
keeping means if the subsequent access of the page occurs while the page is
open, the resetting means operating to further delay execution of the precharge
operation initiated by the precharge command.

Claim 4 (Currently amended): The semiconductor ~~A semiconductor~~
memory device according to claim 1, wherein the bank comprises memory
cells arranged in arrays of rows and columns, and the keeping means
comprises a counter in a row path operatively connected to the rows of the
bank.

Claim 5 (Currently amended): The semiconductor ~~A semiconductor~~
memory device according to claim 1, wherein the device comprises a SRAM
register coupled to the sense amplifier to provide low column access latency.
~~the keeping means comprises latches coupled to a sense amplifier associated~~
~~with the bank, the latches operating in the storage of data read from and~~
~~written to the sense amplifier.~~

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Claim 6 (Currently amended): A semiconductor memory device comprising a bank with multiple pages, the device comprising means for keeping multiple pages open on the bank, according to claim 1, wherein the device comprises a sense amplifier and a SRAM register coupled to the sense amplifier to provide low column access latency.

Claim 7 (Currently amended): The semiconductor A semiconductor memory device according to claim 1, wherein bank comprises memory cells arranged in arrays of rows and columns, the memory cells comprise storage cells, and the storage cells comprise at least one transistor and at least one capacitor.

Claim 8 (Currently amended): The semiconductor A semiconductor memory device according to claim 1, wherein the device has a dynamic random access memory architecture.

Claim 9 (Currently amended): The semiconductor A semiconductor memory device according to claim 1, wherein the device is a nonvolatile memory device with multiple pages open in a block or sector thereof.

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Claim 10 (Currently amended): The semiconductor -A
semiconductor- memory device according to claim 9, wherein the device is a
flash memory device.

Claim 11 (Currently amended): A semiconductor memory controller
operable to issue commands to a memory module comprising multiple memory
integrated circuits with memory cells arranged in arrays of rows and columns
defining multiple pages, the memory controller comprising means for
performing a posted precharge operation immediately after a command for a
first access of a page in anticipation of a subsequent access of the page, the
performing means comprising latches coupled to sense amplifiers associated
with the memory integrated circuits, the latches operating in the storage of data
read-from and written-to the sense amplifiers.

Claim 12 (Currently amended): The semiconductor -A
semiconductor- memory controller according to claim 11, wherein the
performing means comprises a counter in a row path operatively connected to
the rows of the memory cells.

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Claim 13 (Currently amended): The semiconductor -A
~~semiconductor~~ memory controller according to claim 12, further comprising
means for resetting the counter if the subsequent access of the page occurs
while the page is open, the resetting means operating to further delay execution
of the precharge operation.

Claim 14 (Currently amended): The semiconductor -A
~~semiconductor~~ memory controller according to claim 11, further comprising
means for resetting the performing means if the subsequent access of the
page occurs while the page is open, the resetting means operating to further
delay execution of the precharge operation.

Claim 15 (Currently amended): The semiconductor -A
~~semiconductor~~ memory controller according to claim 11, wherein the memory
controller comprises a SRAM register coupled to the sense amplifiers to
provide low column access latency. ~~the performing means comprises latches~~
~~coupled to sense amplifiers associated with the memory integrated circuits, the~~
~~latches operating in the storage of data read from and written to the sense~~
~~amplifiers.~~

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Claim 16 (Currently amended): A semiconductor memory controller
operable to issue commands to a memory module comprising multiple memory
integrated circuits with memory cells arranged in arrays of rows and columns
defining multiple pages, the memory controller comprising means for
performing a posted precharge operation immediately after a command for a
first access of a page in anticipation of a subsequent access of the page,
according to claim 11, wherein the memory controller further comprises sense
amplifiers and a SRAM register coupled to the sense amplifiers to provide low
column access latency.

Claim 17 (Currently amended): The semiconductor -A
semiconductor memory controller according to claim 11, wherein the memory
cells comprise storage cells, and each of the storage cells comprises at least
one transistor and at least one capacitor.

Claim 18 (Currently amended): The semiconductor -A
semiconductor memory controller according to claim 11, wherein the memory
controller is a component of a dynamic random access memory architecture.

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Claim 19 (Currently amended): The semiconductor -A
~~semiconductor~~ memory controller according to claim 11, wherein the memory controller is a component of a nonvolatile memory device with multiple pages open in a block or sector thereof.

Claim 20 (Currently amended): The semiconductor -A
~~semiconductor~~ memory controller according to claim 19, wherein the memory controller is a flash memory device.

Claim 21 (Currently amended): A method comprising the step of keeping open more than one page of multiple pages on a bank of a semiconductor memory device, wherein the keeping step is performed with latches coupled to a sense amplifier associated with the bank, the latches operating in the storage of data read-from and written-to the sense amplifier.

Claim 22 (Currently amended): The method -A method- according to claim 21, wherein the step comprises posting a precharge command immediately after a command for a first access of one of the multiple pages in anticipation of a subsequent access of the page.

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Claim 23 (Currently amended): The method ~~A method~~ according to claim 22, wherein the page is kept open for a number of clock cycles following the precharge command and the precharge command causes a precharge operation to be executed after completion of the number of clock cycles.

Claim 24 (Currently amended): The method ~~A method~~ according to claim 23, further comprising the step of resetting the number of clock cycles if the subsequent access of the page occurs while the page is open, the resetting step operating to further delay execution of the precharge operation.

Claim 25 (Currently amended): The method ~~A method~~ according to claim 22, wherein a precharge operation is initiated after the precharge command and following a delay determined by a counter.

Claim 26 (Currently amended): The method ~~A method~~ according to claim 25, further comprising the step of resetting the counter so as to further delay the precharge operation if the subsequent access of the page occurs while the page is open.

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Claim 27 (Currently amended): The method -A method- according to claim 21, wherein the bank comprises memory cells arranged in arrays of rows and columns, and the precharge command is performed by a precharge counter that, when a row address is latched and a page is opened, the counter locks into the row address until reset, and when the precharge command is made, an internal activation for performing a precharge operation is activated after a predetermined number of clock cycles.

Claim 28 (New): The method according to claim 21, further comprising the step of providing low column access latency with the sense amplifier and a SRAM register coupled to the sense amplifier.

Claim 29 (New): The semiconductor memory device according to claim 6, wherein the keeping means comprises latches coupled to the sense amplifier and operating in the storage of data read-from and written-to the sense amplifier.

Claim 30 (New): The semiconductor memory controller according to claim 16, wherein the performing means comprises latches coupled to the sense amplifiers and operating in the storage of data read-from and written-to the sense amplifiers.